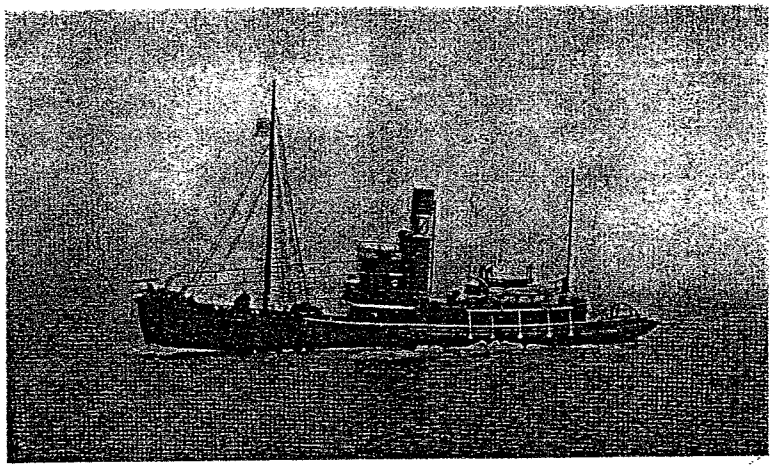
sion held by a Havana company and declared shark fishing open to the public. This action was taken in the hope of ridding the waters near Havana of man-eaters "which have killed three bathers in the last ten days."

Lack of space does not permit consideration of the abundant note- and scrap-book material remaining at hand on this subject. It extends from the Caribbean Sea to the Indian Ocean and will serve for another equally unpleasant chapter later on.

Fortunately for the commercial fisheries as well as for humanity in general, the recent extension of the shark-leather industry to many parts of the world has served to put a worthwhile price on the head and hide of an old criminal still at large, long known to sailors as "Jack Shark."



The steam-powered, whale-killing boat of to-day is usually about 100 feet long and has a harpoon-firing cannon mounted on the bow. Photograph from Bryn, Sandefjord, Norway.

Where the Nineteenth Century Whaler Made His Catch

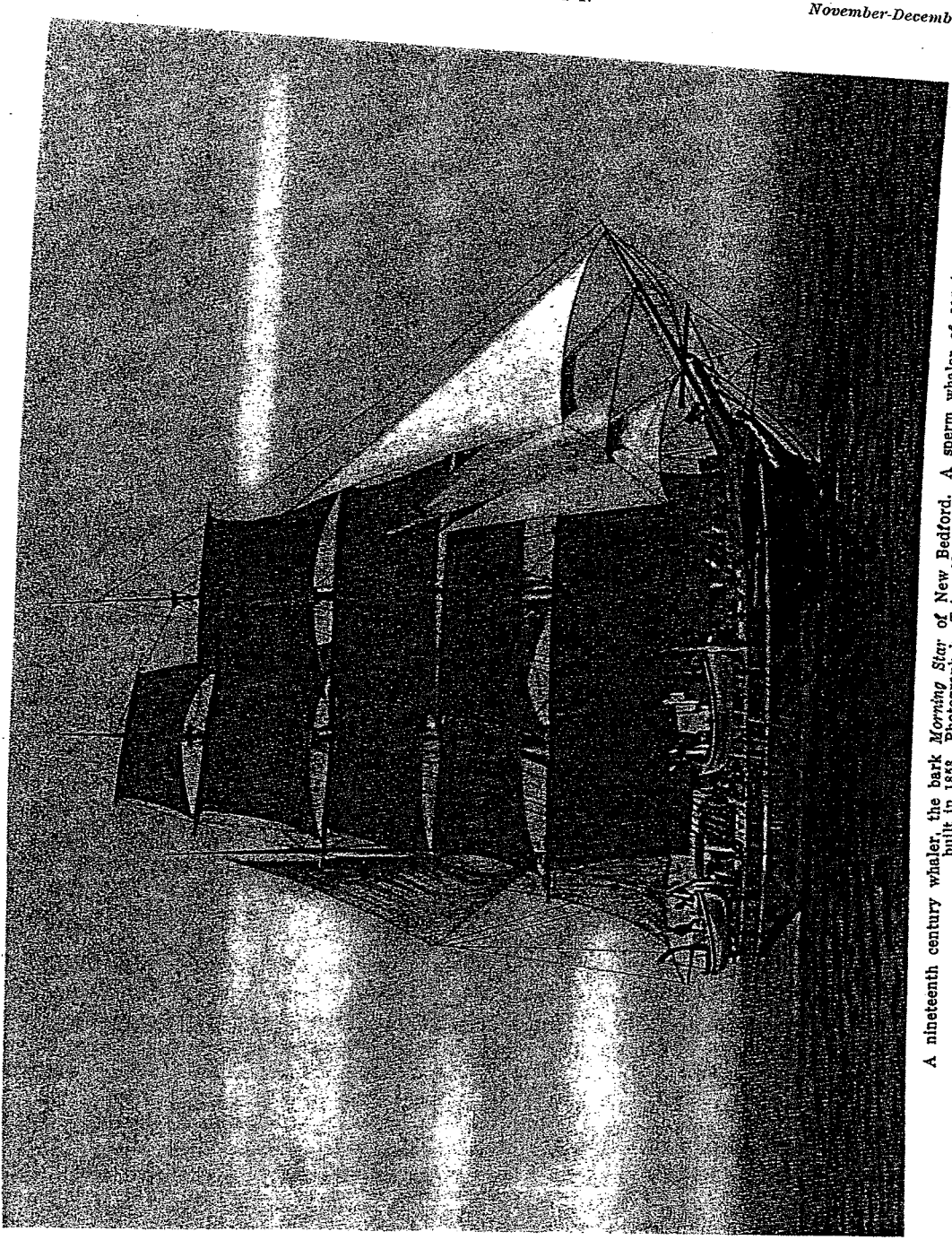
CHARLES HASKINS TOWNSEND

IT has always been recognized that the distribution and seasonal movements of whales in the wide expanse of the seas were not well known.

While examining logbooks of whaling vessels in the New Bedford Public Library, it became apparent to me that they represented a supply of hitherto unused records available for additional information on this subject. The logbooks, hundreds in number, show clearly where the nineteenth century whaler made his catches of sperm, bowhead, right, gray, humpback and occasionally other species. A little experimental plotting on a chart indicated that much could be learned of distribution by extensive work of this sort and by using a separate chart for each species. It was also evident that by using a distinctive color for each month's captures, the movements of whales would be apparent to a considerable degree. The plotting of the positions of whaleships on days when whales were taken, threw light on the locations and dimensions of the "whaling grounds" frequented by the old-time whalers as well as the seasons when they were visited.

Another large collection of nineteenth century logbooks was found in the Whaling Museum of Old Dartmouth Historical Society in New Bedford. Other important collections of whale-ship logs have been located at Nantucket, Salem and other New England ports celebrated in the history of the whaling industry. The compilation of records to be found in these towns will be taken up on behalf of the New York Zoological Society as soon as the work in New Bedford is completed.

The chart presented herewith contains only the first lot of records on sperm whaling. The



A nineteenth century whaler, the bark *Morning Star* of New Bedford. A sperm whaler of 805 tons built in 1858. Photograph by Tripp, New Bedford.

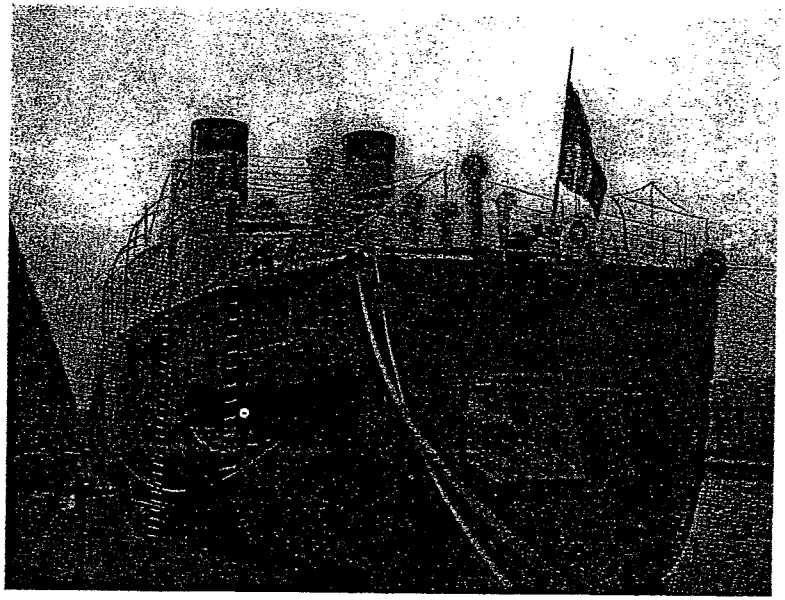
total number of sperm whales represented by the plottings on it is 11,026. Each month's captures being distinctively colored, they present evidence of considerable movement of whales away from the Equator according to season. A study of this chart shows that the catch of sperm whales by the nineteenth century whaler was made chiefly between the north and south latitudes of forty degrees. The known distribution of this species both northward and southward is somewhat wider. It is in general an inhabitant of tropical and temperate seas, ranging into cold waters only in limited numbers. A few stragglers are now being taken in Antarctic waters. The sperm whaler made voyages lasting from two to four years. He sailed all tropical and temperate seas and operated at all seasons. The "whaling grounds" as shown on the six charts now in preparation are naturally very widely scattered, whales being found in cold, temperate and tropical seas both north and south. Some species are of limited distribution while others migrate extensively according to season, sea temperature, breeding range or food supply.

We are here dealing with whaling operations as conducted when sailing vessels were employed and whales were killed with harpoons thrown from open boats. The whales taken were the slower species that could be captured by such methods and that did not sink when killed. The nineteenth century whaler did not take the great blue whale, the finback and other kinds now being captured in great numbers by more effective equipment and his logbooks contain little or nothing about them.

Twentieth century whaling, at present involving the killing of over 30,000 whalebone whales a year, is vastly more destructive. The catch is made by steam-powered hunting boats carrying small cannon and whales are towed to a limited number of stations on shore or to large cruising factory steamers. Forty factory vessels and a smaller number of shore stations are sufficient for the enormous annual catch of today, while the old time sailing fleet numbered hundreds of vessels. In 1846 there were 735 whaling vessels sailing under the flag of the United States. At its best period that great fleet probably captured less than 10,000 whales a year.

The plottings on the sperm whale chart

Sperm whale with mouth open. This is the only large whale with teeth.
Photograph from Bryn, Sandefjord.

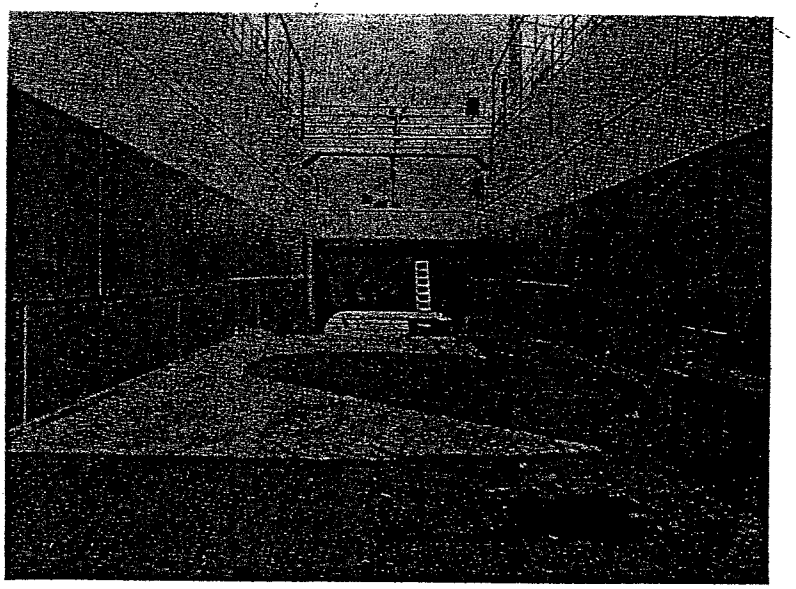


The Antarctic whaler, *Sir James Clark Ross*. Showing slip through which whales are pulled on board. Photograph by C. H. Townsend, 1931.

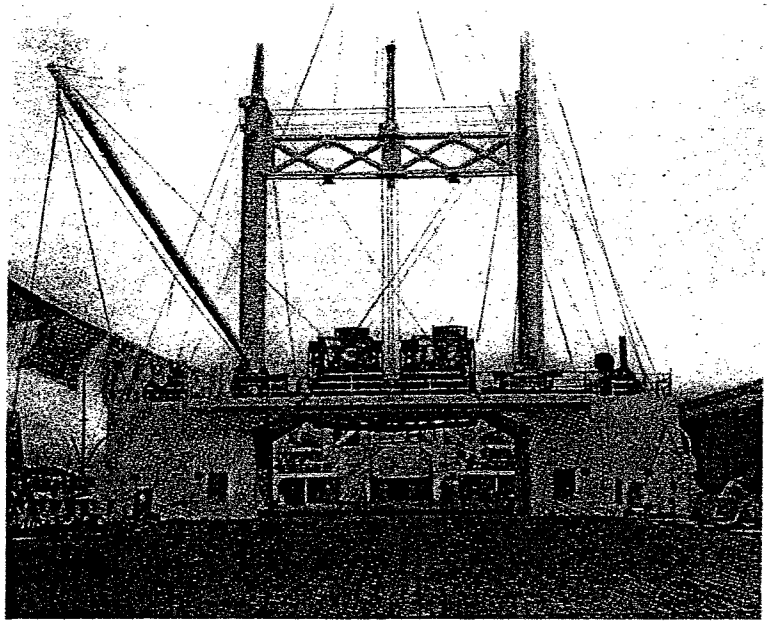
massed along or near the Equator, are confusing. The chart became overloaded with data before we realized that there might be a better method of presentation. As there is a similar supply of records on hand representing perhaps more than 10,000 additional captures of sperm whales, these are being plotted on two charts—one for the April-September season, the other for the rest of the year. These cannot be completed until after further records have been copied from logbooks, especially those coming from Nantucket. The charts already show clearly the seasonal oscillation of sperm whales between north and south latitudes.

The plottings on the chart presented in this Bulletin make it of service chiefly as showing positions and extent of whaling grounds. It is not to be expected that the seasonal movements of sperm whales in the broad Pacific will correspond very closely with those of the much narrower Atlantic. The great currents of the two oceans differ in direction and force and there are great climatic differences. The movements of sperm whales in the Indian Ocean are geographically limited at the north. Most of the catch there was made south of the Equator. Such conditions affecting movements of whales as winds, temperature, salinity and food are not considered here. The food of the heavily-toothed sperm whale is altogether different from that of the whalebone whales of paramount commercial importance today.

It will be seen that in the North Atlantic, the plotted areas above latitude twenty-five degrees are with few exceptions, for the April-September period. The massed plottings in the Sargasso region are almost entirely those pertaining to the summer season of the northern hemisphere. Between



Antarctic whaler, *Sir James Clark Ross*. View toward slip through which whales are pulled on board. Photograph by C. H. Townsend.



Antarctic whaler, *Sir James Clark Ross*. View aft along the flensing deck. Photograph by C. H. Townsend.

north latitude twenty-five degrees and the Equator, whales were taken chiefly during the October-March season. Along the east coast of South America, the catches were largely made during the same season or summer time in the southern hemisphere. Along latitude thirty-five degrees south, toward the Cape of Good Hope, whaling data are also for the October-March season. Off Japan and along latitude thirty degrees north, the plottings are those of the April-September season.

In the Pacific and to some extent in the Atlantic equatorial belts, catches for all months of the year are represented. Off the west coast of South America south of the Equator, the plottings pertain mostly to the summer season of the southern hemisphere. There was much whaling off Peru at this season. Off the west coast of South Africa, the extensive whaling during all months of the year may be attributed to the effect of the cool, northward-flowing Benguela Current. The massed areas off the west coast of northern South America, where whaling was also carried on at all seasons, may be similarly explained by the cool northward-flowing Humboldt Current. This current, deflected westward at the Equator is responsible for the uniformly cool sea temperatures about the Galapagos Archipelago where large numbers of sperm whales were taken during more than half a century.

Whaling Grounds.—There is frequent mention in the logs of sperm "whaling grounds," twelve of which were in the North Atlantic: Western Grounds (31°N. 50°W.). This is the great mid-ocean Sargasso region, its center being in the latitude of Bermuda and nearer Bermuda than Madeira. Whaling was carried on here almost entirely during the season from April to September, inclusive.

The Western Islands Ground (37°N.25°-33°W.), was around the Azores where sperm whaling was done mostly in summer. The Charleston Grounds (30°N.70°-77°W.), lay between Hatteras and the Bahamas, mostly to the eastward of the Gulf Stream. The Cornell Ground (6°N.20°W.), was a winter ground between the Cape Verde Islands and the Equator.

The Steen Ground (31°-36°N.21°-24°W.), lay west of Madeira, where sperm whales were taken both in summer and winter. The Two-Forties (40°N.40°W.), lying northwest of the Azores, was visited in summer. On the Twenty-Twenties (20°N.20°W.), north of Cape Verde Islands, whales were taken during the winter months. The Two-Thirty-sizes (36°N.36°W.), southwest of the Azores, was mostly a summer ground. A mid-ocean whaling ground known as the Twelve-Forty (12°N.40°W.), between the West Indies and Cape Verde Islands was visited from February to May inclusive. This area is frequently mentioned in the logs.

The St. Antonio Ground (18°N.26°W.) seems to be about the same as the Twenty-Twenties.

The Southern Ground (36°-38°N.72°-74°W.) had its center in the latitude of Norfolk. It was an extensive Gulf Stream area as indicated by the plottings, frequented almost entirely in

summer. The Hatteras Ground, also visited in summer, lay off the Cape along the Gulf Stream.

Another summer whaling ground was called Gulf of Mexico Ground (28°-29°N.89°90°W.). Often mentioned in the logs was the Commodore Morris Ground (50°-52°N.21°-24°W.), a summer whaling field southwest of the British Isles, the most northerly Atlantic sperm whaling ground according to our records, its moderate sea temperature being influenced by the North Atlantic Drift of the Gulf Stream. There were four sperm whaling grounds in the South Atlantic frequently mentioned in the log books: The Brazil Banks, actually off Argentina, (roughly 39°-42°S.57°-60°W.), was also a right whaling ground, first fished about 1774; the Cornell Ground (17°S.8°W.) around St. Helena; the Platte Grounds (34°-37°S.48°-52°W.) off Rio de la Plata, visited by sperm whalers from October to March inclusive, and the Tristan Grounds (33°-39°S.10°-23°W.) being the region around Tristan da Cunha Islands. Woolwich Bay (Walfisch Bay) west coast of Africa, and coast of Patagonia are common logbook names of sperm whaling grounds.

In the North Pacific a sperm whaling region often referred to was the Japan Grounds (29°-32°N.160°-175°E.) extending westward from Midway Island. It was a famous whaling area discovered in 1820. Sperm whaling was also practiced off the coast of Japan but so far we find no logbook name for this ground.

The Off-shore Grounds (5°-10°S.105°-125°W.) lay west of the Galapagos Islands, on and south of the Equator. It was the most famous of the Pacific sperm whaling regions and was visited at all seasons. It was discovered with much acclaim in 1818. The whaling grounds called On The Line lay along the equatorial region westward from the Off Shore Grounds. Sperm whales were taken there at all seasons.

French Rock Grounds (32°S.180) fished during most of the year, lay around the Kermadec Islands north of New Zealand. Middle Ground was between New Zealand and Australia.

Whalemen often referred to other Pacific sperm whaling areas, the positions of which are obvious: Panama Bay, Galapagos, Coast of Chili, Callao and Coast of New Holland (or later Australia) generally in reference to the west and south coasts. Among the islands between Australia and the Philippines there was sperm whaling at all seasons, one area being the Sooloo Ground in the Mindoro Sea. There was a distinct seasonal movement of whales between the Sulu Sea and the Celebes Sea. Sperm whaling grounds in the Indian Ocean were known as Coast of Arabia, Mahe Banks, Seychelles, Delagoa Bay, Zanzibar and Mozambique. Whaling in the Arabian Sea (Lat. 15°N.) was done chiefly in December and January.

In listing the sperm whaling grounds, frequented by the old-time whalers, we have taken only the names used in the logbooks. Other grounds are referred to but not in connection with sperm whaling.

It should be explained that on a few whaling grounds where the plottings are very dense, the draughtsman extended the areas slightly for lack of space. These are off the west coast of South Africa and off the east coast of South America; around the Galapagos Islands; off Northern New Zealand and off the north coast of Japan.

In other charts now in preparation, this difficulty is avoided by omitting some of the data, rather than extend the ground beyond actual whaling limits.

The sperm whale, formerly abundant, still figures in the catch of the twentieth century whaler. It is taken, but to a very limited extent, mostly at shore stations on the coasts of Japan, Norway and South Africa, stragglers being found as far south as South Georgia and the summer border of the Antarctic ice. The total number of sperm whales taken during the season of 1929-30 was 1,352, the world catch of all species for that period being 38,563—the greatest number of whales ever taken in one season.

The additional charts in preparation for the New York Zoological Society will show positions where many thousands of whales, of five species, were taken during the nineteenth century.

The Whaling Season of 1929-1930

The Norwegian Whaling Gazette in the September number of 1931 announces the world catch during the season of 1929-1930 to have amounted to the surprising number of 38,563

whales. Of this record number, 19,080 were blue whales, 14,350 finback, 1923 humpback, 922 sei, 1,352 sperm and 936 of other species. The bulk of the catch, 30,654 whales, was made in Antarctic waters and chiefly by Norwegians. The remainder, 7,909, were taken in tropical and northern seas, that of Japan being largest with 1,714 whales. Thirty of these were the rather scarce gray whales, confined to the North Pacific and 753 were sperm whales.

Operating off the Santa Barbara Islands along our own coast and off Lower California, the whaler *Lansing,* with which the writer cruised in 1929, took 300 whales. Shore stations in Alaska and British Columbia captured 675 whales.

On April 20 the writer boarded the Norwegian Antarctic whaler *Sir James Clark Ross* at Staten Island where the vessel's catch, 55,000 barrels, was sold to one firm for soap making, at an estimated value of over $1,500,000. The *Ross* had seven steam whale-killing boats, a crew of 245 men and had taken during the season 1,445 whales. This vessel was followed to Staten Island ten days later by the Antarctic whaler, *C. A. Larsen,* with a catch of whales nearly as large. The total world yield of whale oil for the season of 1929-30, exceeded 3,427,000 barrels. There was great overproduction and most of the oil went to storage, with the result that whaling in general is suspended for the present year. The whales need a respite, in fact a longer one than they are likely to get.

The Antarctic field, in the whaling industry of the past few years, has been exploited with remarkable intensity.

The Supply of Fresh-water Fishes

During recent years the Aquarium has found it increasingly difficult to maintain a satisfactory collection of Eastern fresh-water fishes. The local sources of supply, fairly productive twenty-five years ago, no longer yield fishes of the larger sizes. The exhibits of basses, perches, pickerels, catfishes, sunfishes, et cetera, representing numerous species of these families, have long consisted of rather small specimens.

Among the causes contributing to the diminution of the supply are a great increase in the number of anglers, as a result of extensive road building, and the ever rising numbers of automobiles cruising through the rural sections of the whole country. Angling waters have become more and more accessible to campers. Waters once pure now suffer from manufacturing wastes, sewage and oil washed from highways. The fish supply of the markets is now derived chiefly from the sea. There is little fresh-water market stock available except what comes from the Great Lakes, the lakes of Canada and the Mississippi River. The Great Lakes have suffered from long-continued and exhaustive commercial fishing.

In May of the present year the Aquarium secured a truck so that its collector could go farther afield. Permits were obtained for the drawing of seines in distant reservoirs where larger fishes were secured "strictly for exhibition in the Aquarium." This effected considerable improvement in our collection but the results were not all that could be desired. As many years had passed since the Aquarium received fishes from the Mississippi, it seemed advisable to vary the collection with additional species. Accordingly, two of our men were sent to the Government Fisheries Station, at Fairport, Iowa, where they secured about two thousand fishes by seining in the great river. These were held in the Government ponds at Fairport until the work of collecting was completed. By special arrangement with the Nuchem-Messing Live Fish Corporation of New York, one of their tank cars, used in the transportation of live fishes, called at Fairport on its return trip and brought back the Aquarium collection.

In addition to larger specimens of widely distributed fishes, not readily available in the East, there were numerous species belonging to the Mississippi and its tributaries. Among the latter are shove-nose sturgeon, fresh-water drum, buffalo fish, white bass, yellow bass, quill-back sucker, moon-eye, gizzard shad, channel catfish, crappie and various sunfishes. The arrival of these and others equally interesting, has provided a good exhibit of fresh-water fishes.